

**REMARKS**

Reconsideration is respectfully requested of the objection to claims 84 and 87, and to the rejection of claim 58-88 under 35 U.S.C. §112.

**I. Objection to Claims 84 and 87**

Claims 84 and 87 are objected to for alleged lack of clarity. The statutory ground is not specified, but is presumably §112, second paragraph.

The Office action initially offers no explanation for the objection, but it is apparently based on the recitation of "one or more glycosaminoglycans" as articulated in the §112, second paragraph rejection stated later in the Office action. This ground of rejection is addressed hereinbelow.

Applicants respectfully decline to amend claim 84 in the manner suggested, primarily because introduction of the term "consisting essentially of" arbitrarily and unnecessarily limits the scope of the claim.

While the proposed amendments to claim 87 appears innocuous on its face, Applicants are deterred from making the suggested amendments because of the limiting scope the term "a" might be given in light of the grounds stated by the Examiner for the §112 rejection of claims 58, 65-67, 83, 86, 87 and the claims dependent therefrom as set forth at p. 6 of the Office action. According to conventional claim construction principles, "a" means "at least one" or "one or more." But p. 6 of the action seems to indicate an intent by the Patent Office to limit the scope of "a" to "one and only one." Until the uncertainty created by the §112 rejection has been resolved, Applicants respectfully decline to make the proposed amendment to claim 87.

## II. Rejections Under 35 U.S.C. §112, First Paragraph

Reconsideration is respectfully requested of the rejection of claims 58-88 under §112, first paragraph.

### A. How the Brushite is Formed

It is respectfully submitted that the Examiner has mistakenly identified as "essential" a step that is not required by the claim and is not essential to the process as developed and disclosed by Applicants. Nothing in the disclosure suggests that it is necessary to specify "how the brushite is formed before it is precipitated as a triple co-precipitate." What is essential as called for in claim 58 is the formation of a "triple co-precipitate." The mechanism by which it is formed is not recited in the claim because the mechanism is not essential so long as the triple co-precipitate is formed. More particularly, it is unnecessary to amend the claim to specify "how the brushite is formed *before* it is precipitated" because: (i) the invention is not limited to the particular mechanism by which the brushite is formed; and (ii) there is no requirement that it be formed *before* it precipitates. The inventive process is replicated regardless of the particular mechanism of formation, and regardless of whether the brushite is formed *before* it precipitates, or *as* it precipitates.

Note that the process of Example 1 comprises stirring for 60 minutes and aging for two days after all the components for the triple co-precipitate have been brought together in the aqueous precipitation medium. One skilled in the art would recognize that the kinetics of formation of each of the inorganic and organic precipitates would not necessarily be identical. Moreover, Example 2 describes a procedure in which phosphoric acid is first combined with collagen, and

chondroitin-6-sulphate is added to the acidic collagen suspension and stirred for 90 minutes before  $\text{Ca}(\text{OH})_2$  and  $\text{Ca}(\text{NO}_3)_2$  are added. The calcium hydroxide and calcium nitrate are added to the highly viscous collagen/GAG dispersion over a period of 30 more minutes, and then additional phosphoric acid is added. Example 3 is comparably protracted. One skilled in the art would not necessarily expect all components of the triple co-precipitate to form at an exactly simultaneous instant during the course of this procedure. Nor is it essential to the invention that they do so.

The specification states that "the term triple precipitate encompasses precipitation of the three compounds at "substantially the same time" (paragraph [0012], p. 1, but the claim is not limited to substantially simultaneous precipitation. The claim properly requires only that the components precipitate "together," i.e., to form the "triple co-precipitate." Paragraph [0012] differentiates the precipitation process from mechanical mixing, but does not place limits on the reactive mechanisms or kinetics of precipitation. Thus, details of the mechanisms are not critical to the invention. In the context of the invention as described in the specification, and the state of the art with regard to the formation and behavior of the materials that are used in the claimed process, one skilled in the art would know what "substantially the same time" means. But since the claimed process is not limited to precipitation at "substantially the same time," that issue is academic.

#### B. "Glycosaminoglycans"

The Office action does not articulate the grounds on which the Examiner finds lack of support for "glycosaminoglycans" as recited in claim 58. Since the generic term

"glycosaminoglycans" is used in the specification and appears in the original claims, support for this term is not limited to the Markush group of GAGs that is listed in claim 64.

If the issue is written description, there is a strong presumption that written description support exists where the generic term appears in original claims and/or in statements of the invention in the specification that are commensurate in scope with the claim; MPEP §2163(I)(A). As established in *Vas-Cath*, the written description requirement is met where the specification conveys to those skilled in the art that the inventors were in possession of the invention as claimed at the time the application was filed. "Possession" in this sense means that the written description conveys to those skilled in the art that the invention in its defined scope was contemplated by the inventor at the time of filing, and that the art-skilled reader can recognize a replication of the invention as so contemplated. Where a generic structural term such as "glycosaminoglycan" is used, it unequivocally conveys to one skilled in the art that the inventors contemplated formulations generically including compounds within this class of polysaccharides.

Where a component such as "glycosaminoglycans" is identified by unambiguous chemical nomenclature definitively associated with molecular structure, there is no need to resort to "physical and/or chemical properties, .... functional characteristics....," etc. that offer alternative grounds for meeting the written description requirement where adequate chemical nomenclature is unavailable. Contrary to the assertion at p. 5 of the Office action, a person skilled in the art can readily visualize the chemical structure common to the generic class of "glycosaminoglycans," just as a skilled person can readily visualize any component that is defined by generic

chemical nomenclature. The generic structure of "glycosaminoglycans" is universally well known.

In this regard, the claims fully comply with the requirements of *Fiers v. Revel* and in fact exemplify one of the ways in which that decision explains that the written description can be met, i.e., by "chemical name." The facts here are at the polar opposite from those in *Fiers* in which the DNA in question was defined only by what it does and not what it is, i.e.:

"DNA which consists essentially of a DNA which codes for a human fibroblast interferon-beta polypeptide."

The *Fiers* opinion characterized this as analogous to a "single means" claim, i.e., a claim engrossing essentially any DNA meeting the prescribed result. Had the claim provided an adequate description of a generically defined DNA structure, the result would have been different, as the opinion unquestionably shows.

Thus, the only remaining basis for rejection of the claims under §112, first paragraph, is enablement. But the Examiner has not questioned enablement; and in any case, where the specification contains a statement of the invention commensurate in scope with the claims, the disclosure must be taken as enabling unless the Office offers evidence or reasoning negating enablement; *in re Marzocchi*, 169 USPQ 367 (CCPA 1971). No such evidence or reasoning having been offered, and it is our understanding that the Examiner recognizes the specification as meeting the enablement requirement with regard to claims 58-88.

It is therefore respectfully submitted that claims 58-88 and the specification on which they are based fully comply with the requirements of §112, first paragraph.

### III. Rejections Under 35 U.S.C. §112, Second Paragraph

#### A. "One or More Glycosaminoglycans"

Reconsideration is respectfully requested of the rejection of claims 58, 73, 84, 86, 87 and the claims dependent therefrom as indefinite for the recitation of "one or more glycosaminoglycans" in a triple co-precipitate. As explained in paragraph [0048] of the specification:

"Preferably, the processes of the present invention further comprise the step of crosslinking the one or more glycosaminoglycans and the collagen in the triple co-precipitate. By triple co-precipitate this includes the triple co-precipitate comprising collagen, brushite and one or more glycosaminoglycans and derivatives of the co-precipitate." (Emphasis supplied)

Later, in paragraph [0074], the specification describes the triple co-precipitation step of the process:

"This step is performed to initiate simultaneous formation, via precipitation from solution, of the three (or more) constituents of the composite, and to control the ratio of the three (or more) respective phases. .... Additives to aid crosslinking (e.g. glucose, ribose) or to enhance in-vivo response (e.g. growth factors, gene transcription factors, silicon, natriuretic peptides) may also be added during this step. (Emphasis supplied)

From these passages is it apparent that the glycosamino-glycan component is not limited to a single glycosaminoglycan, and that components other than collagen, brushite, and glycoaminoglycan(s) are not excluded from the claimed composite, but on the contrary can be intermingled with the co-precipitate.

Accordingly, there is no reason to compel amendment of claim 58 to call for "a glycosaminoglycan" rather than "one or more glycosaminoglycans." As noted in discussion of the objection to claims 84 and 87, the term "a" would ordinarily read as "one or more...", and if it were made clear on this record that the indefinite article "a" preserves its

conventional meaning, Applicants might be satisfied to make the amendment and resolve the issue. But as long as any basis remains for an inference that the claim as so amended is limited to a single glycosaminoglycan, or that it excludes components other than the three named precipitates, the scope of the claim does not adequately correspond to the scope of invention, and the amendment improperly and unfairly deprives Applicants of protection commensurate with their contribution to the art.

B. Antecedent for "The Aqueous Solution" and "Solution"

With respect to the term "the aqueous solution" in second step of claim 58, Applicants respectfully note that antecedent basis appears in the first step which calls for "providing an acidic aqueous solution" (Emphasis supplied). Each of claims 65, 69 and 88 depends from claim 58. Consequently "an acidic aqueous solution" in claim 58 also provides the antecedent for "the solution" in claim 65 and 69, and the "aqueous solution" in claim 69.

As to the term "at least some of the brushite" in the second step of claim 73, antecedent basis is provided by the recitation of "providing a composite material comprising ..... brushite..." in the first step.

The additional ground on which the Examiner has rejected claim 73 is based on a misreading of the claim. The claim is directed to "a process comprising ... providing a composite material comprising collagen, brushite and one or more glycosaminoglycans." The claim does not prescribe, nor does §112 require it to prescribe, every component in the composite material, i.e., it does not require that the claim specify what the composite material "consists of." Since there is an unequivocal nexus between the preamble of the claim and what the

composite comprises, the claim is definitive and does not need to be amended in the manner which the Office action proposes.

Finally, claim 75 is definitive because the limiting pH is uniquely defined by the pH at which octacalcium phosphate becomes more stable than brushite. In a given solution, one skilled in the art can readily determine what that pH is. Paragraph [0031] of the specification explains that the specified pH is preferably in the range from 6 to 8, more preferably 6.3 to 7 and most preferably 6.65. Thus, one skilled in the art not only knows how to identify the pH but is given very specific directions on where to find it. Moreover, the claim does not require operation exactly at the pH at which octacalcium phosphate becomes more thermodynamically stable than brushite, but rather anywhere above that pH. For example, the specification recommends a pH 8.0 or more for about 12 hours, paragraph [0043]. Whether any given operation falls within the claim is a simple matter of determining whether brushite is converted to octacalcium phosphate.

It is therefore respectfully submitted that there is no ambiguity in any of claims 58-88, and that one skilled in the art will fully understand the metes and bounds of each of these claims. Consequently, it is submitted that each and all of claims 58-88 particularly point out and distinctly claim the subject matter which Applicants regard as their invention, and thereby fully comply with the requirements of 35 U.S.C. §112, second paragraph.



**IV. Conclusion**

In view of the foregoing, it is respectfully submitted that claims 58-88 fully comply with 35 U.S.C. §112 and define patentably over the art of record. Reconsideration and early allowance of all claims is respectfully solicited.

Respectfully submitted,

/paul fleischut/

Paul Fleischut, Reg. No. 35,513  
SENNIGER POWERS LLP  
100 North Broadway, 17th Floor  
St. Louis, Missouri 63102  
(314) 345-7000

PIF/axj